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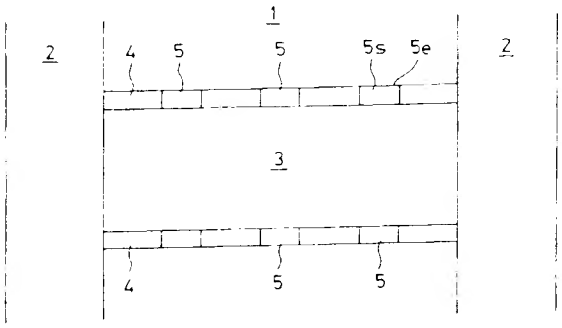
(54) Road display apparatus and light source for said road display apparatus.

(57) The road display apparatus in accordance with the present invention is used such that the presence of a variety of displays such as a pedestrian crossing, a guard rail and the like is clearly recognized by vehicle drivers and pedestrians at all times day and night regardless of good or bad weather conditions. The road display apparatus comprises a display and a light emitting member (5) disposed at the display at a predetermined portion thereof, the light emitting member (5) having (i) a light absorbing surface (5s) for absorbing light coming from a variety of light sources such as the sun's rays, the headlights of motor vehicles, road lamps and the like, and (ii) a light radiating portion (5e) for emitting the light absorbed by the light absorbing surface (5s), as secondary light, which is then radiated to the outside. Thus, since a variety of light sources are efficiently utilized, an energy can be advantageously saved.

Fig.1



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Background of the Invention

1. Field of the Invention

The present invention relates to a road display apparatus installed at any of a pedestrian crossing on its white lines, a guard rail, a center separation zone, a display disposed at the time of road construction, a pedestrian crossing bridge, a road under an elevated railroad or the like, a tunnel and the like for informing road conditions to pedestrians or drivers of motor vehicles thereby to contribute to traffic safety. The present invention also relates to a light source for such road display apparatus when this apparatus uses light.

The road display apparatus is so arranged as to contribute to traffic safety when the presence of such apparatus is clearly recognized by pedestrians or drivers of motor vehicles not only in the daytime but also at night regardless of weather conditions. When light is used for the road display apparatus, it is important to provide a light source regardless of weather conditions both in the daytime and night.

2. Description of the Invention

Conventionally, such road display apparatus is put in practice in the following manners. As often seen, highly distinguishable white or yellow lines are put to pedestrian crossings or guide rails. The sun's rays stored with the use of solar cells in the daytime are radiated and used for illumination in the night, so that road signs are displayed. Cat's-eyes are embedded in a road so that the visibility of the road is improved with the use of rays of light reflected from the headlights of motor vehicles. Reflection plates are attached to guard rails so that, with the use of rays of light reflected from the headlights of motor vehicles, the visibility of guard rails is improved. A fluorescent paint is applied to a road display to improve the visibility of the road display particularly at night.

As a light source for such a road display apparatus, there are conventionally used electricity, solar cells, normal cells and the like.

Out of the conventional road display apparatus, a colored display containing white lines or the like is made with the daytime visibility mainly taken into consideration. Accordingly, such an arrangement lacks visibility at night. There is also available a colored display so managed as to be distinguished by illumination or the like during the night. However, this is not sufficient to provide such visibility as to cause pedestrians or vehicle drivers to clearly understand road conditions.

There is a road display apparatus of the type that cat's-eyes are embedded in roads or reflection plates are attached to guard rails such that, with the use of rays of light reflected from the headlights of motor vehicles, the visibility of roads or guard rails is given to vehicle drivers or the like. However, such apparatus cannot provide sufficient visibility unless motor vehicles move in very close to the parts where cat's eyes are being embedded or reflection plates are being attached. Accordingly, when motor vehicles travel at a high speed, the timing that the drivers apply brakes upon recognition of such cat's-eyes or reflection plates will be delayed so that sufficient safety cannot be assured.

There is a road display apparatus adapted to store heat by solar cells in the daytime and to radiate the stored heat for illumination during the night. If sufficient heat has not been stored in the daytime because the apparatus has portions into which the sun's rays do not come, or because of rain or cloudy weather, a necessary and sufficient display cannot be made by illumination during the night. Thus, a predetermined effect of traffic safety cannot be produced.

A road display apparatus containing a fluorescent paint applied thereto, is adapted not to produce a predetermined fluorescent effect at the time of rain that a water layer is formed on those surfaces of the apparatus to which the fluorescent paint is applied. As a result, the apparatus cannot be improved in visibility during the night.

When electricity or normal cells are used as a light source for such a road display apparatus, the energy is liable to be used in waste for roads where there is not much traffic. It is therefore desired that the light source of the road display apparatus is not limited to the sun's rays or artificial illumination. However, there have been neither light source nor road display apparatus which can satisfy such requirements.

With the increase in traffic, it is desired more strongly not only to prevent traffic accidents with safety improved, but also to provide a road display apparatus which is excellent in visibility and which is low in installation cost. In particular, it is desired to provide a road display apparatus which can be industrialized and mass-produced to decrease the production cost, and which can be readily installed.

Summary of the Invention

In view of the foregoing, the present invention is proposed with the object of providing a road display apparatus which can be well recognized even from a long distance regardless of the weather by day and by night, and which can suitably efficiently utilize any of a variety of light sources.

It is another object of the present invention to provide a light source for road display apparatus, adapted to efficiently use light such as the natural light of the sun's rays, moon light, vehicle head-lights, road lamps such as mercury lamps or the like, thereby to eliminate waste of an energy.

It is a further object of the present invention to provide a light source for road display apparatus, which is reduced in production cost and which is readily installed.

To achieve the main object, the road display apparatus in accordance with a first invention comprises a display and a light emitting member disposed at the display at a predetermined portion thereof, the light emitting member being made of a material having both light absorption properties and directional light-emitting properties, the light emitting member having a light absorbing surface for absorbing light coming from a variety of light sources, and a light radiating portion for emitting the absorbed light as secondary light, which is then radiated to the outside.

The material having both light absorption properties and directional light-emitting properties may be a reain material containing a fluorescent dye. This resin material may be molded into a predetermined configuration to form the light emitting member.

According to the present invention, the light emitting member may be used alone or as combined with optical fibers such that the light outlet ends of the optical fibers are opposite to the light absorbing surface of the light emitting member.

Preferably, the light emitting member has a light radiating portion formed by a cut surface or angular cut surface.

According to the road display apparatus having the arrangement above-mentioned, light absorbed by the light absorbing surface of the light emitting member made of a material having both light absorption properties and directional light-emitting properties, is emitted as secondary light, which is then radiated to the outside from the light radiating portion. Light from any of light sources may be absorbed by the light absorbing surface of the light emitting member. More specifically, the natural light of the sun may be used in the daytime, and road lamps such as mercury lamps, the headlights of motor vehicles and moon light may be efficiently used during the night or at the time when the sun's rays are not sufficiently available in the daytime. Accordingly, the road display apparatus presents a high visibility at all times day and night regardless of weather conditions. Further, since a variety of light sources can be used as mentioned earlier, the energy can be efficiently utilized to achieve an economy of energy. Further, even though it rains so that waterdrops stick to the surface of the light emitting member or the light emitting member is covered at the entire surface thereof with rain, this exerts no influence upon the emittance of secondary light. Accordingly, even though it rains, the road display apparatus of the present invention presents a sufficiently high visibility.

In particular, when the light emitting member is formed by molding, into a predetermined configuration, a resin material containing a fluorescent dye, the light emitting member is excellent in machinability and productivity and can be reduced in production cost. Thus, such a light emitting member is suitably used for a road display apparatus to be used in great quantities. Further, such a light emitting member may be readily attached to a pedestrian crossing, a guard rail, a center separation zone, a walking bridge or the like, causing the light emitting member to be readily systematized as a light-emitting type road display apparatus.

According to the present invention, the light emitting member may be used as combined with optical fibers. In such a case, even though the road display apparatus itself is apart from a light source such as a road lamp or the like, light from the light source can be efficiently transmitted to the road display apparatus without loss. Thus, the road display apparatus presents a high visibility particularly during the night.

The light source for road display apparatus according to a second invention comprises (i) a light condensing unit including a plane light condensing plate and a light condensing device for condensing external light, and (ii) light transmission means for transmitting light condensed at the light condensing unit in a predetermined direction.

According to the present invention, the light transmission means may be formed by optical fibers or a light guide comprising a pipe and a light-reflective thin film formed on the inner surface of the pipe.

The plane condensing plate may be a plane mirror for condensing external light as reflected therefrom, or a Fresnel lens for condensing external light as transmitted therethrough.

Preferably, a light amplifier is disposed in the middle course of the light transmission means.

According to the light source for road display apparatus having the arrangement above-mentioned, light coming from light sources such as the natural light of the sun, moon light, the headlights of motor vehicles, road lamps and the like can be efficiently condensed through the plane light condensing plate, and the light thus condensed can be transmitted without loss in a predetermined direction. Thus, a light source can be provided for a road display apparatus at all times day and night regardless of weather conditions by efficiently utilizing lights from a variety of light sources such as

the natural light of the sun, moon light, the headlights of motor vehicles, road lamps such as mercury lamps and the like.

In particular, when the light amplifier is disposed in the middle course of the light transmission means, even very weak light toward evening for example can be transmitted as amplified. This assures the visibility of the road display apparatus as required.

Other features and effects of the present invention will be apparent from the following description with reference to attached drawings illustrating embodiments of the present invention.

Brief Description of the Drawings

Figure 1 is a plan view of a road display apparatus in accordance with a first embodiment of the present invention;

Figure 2 is a schematic vertical section view of a road display apparatus in accordance with a second embodiment of the present invention;

Figure 3 is an enlarged longitudinal section view of main portions in Figure 2;

Figure 4 is a side view of main portions, with portions broken away, of a road display apparatus in accordance with a third embodiment of the present invention;

Figure 5 is a section view taken along the line V – V in Figure 4;

Figure 6 is a side view of main portions of a road display apparatus in accordance with a fourth embodiment of the present invention;

Figure 7 is a section view taken along the line D – D in Figure 6;

Figure 8 is a side view of main portions of a light source for road display apparatus in accordance with a first embodiment of the present invention;

Figure 9 is a schematic perspective view of light transmitting means and a light emitting portion for road display apparatus shown in Figure 8;

Figure 10 is an enlarged perspective view of main portions shown in Figure 8;

Figure 11 is a perspective view of main portions of a light source for road display apparatus in accordance with a second embodiment of the present invention; and

Figure 12 is a side view of main portions of a light source for road display apparatus in accordance with a third embodiment of the present invention.

Detailed Description of the Preferred Embodiments

Fig. 1 shows a road display apparatus according to a first embodiment of the present invention in which the road display apparatus is applied to a pedestrian crossing. In Fig. 1, a pedestrian crossing 3 crosses a driveway 1 such that sidewalks 2 at both sides of the driveway 1 are connected to each other. Light emitting members 5 rectangular in plan elevation are disposed at suitable regular intervals along both lateral edges of the pedestrian crossing 3. The light emitting members 5 are made of a material having both light absorption properties and directional light emitting properties (e.g. "STEAL LIGHT" manufactured by Fujitsu Kasei Co., Ltd.). Each of the light emitting members 5 has a light absorbing surface 5s (parallel with the paper plane of Fig. 1) which is adapted to absorb light from a variety of light sources, and light radiating portions 5e (cut end parts at both sides in the width direction in Fig. 1) which are adapted to emit, as secondary light, the light incident thereupon from the light absorbing surface 5s thus causing the secondary light to be radiated to the outside.

Each of the light emitting members 5 may be made by molding a mixture containing a fluorescent dye and a resin material such as polycarbonate, polystyrene, methacryl, soft vinyl chloride or the like. The fluorescent dye is adapted to react on light which is caught, thereby to emit a secondary light which is then radiated from the light radiating portions 5e which are cut end surfaces.

As the fluorescent dye, there may be selectively used an orange, red, green, violet or white dye. Light having a wavelength slightly shorter than the spectrum of a color selected, is caught most efficiently and then emitted as a secondary light. Of course, it is desired not to use the colors of which use is inhibited according to a variety of laws and regulations such as the Road Traffic Act or the like.

On the pedestrian crossing 3 in Fig. 1, the natural light of the sun serves as a light source in the daytime. Light absorbed by the light absorbing surfaces 5s of the light emitting members 5 reacts in the light emitting members 5 to emit a secondary light. The secondary light thus emitted is radiated to the outside from the light radiating portions 5e. This enables vehicle drivers or pedestrians to sufficiently recognize the presence of the pedestrian crossing 3 even from a long distance. If the natural light of the sun cannot be obtained during the night or at the time of rainy or cloudy weather, other light than the natural light of the sun, e.g., road lamps such as mercury lamps or the like, the headlights of motor vehicles, moon light or the like, is absorbed from the light absorbing surfaces 5s of the light emitting members 5. A secondary light is then emitted and radiated to the outside from the light radiating portions 5e. This enables vehicle drivers and pedestrians to recog-

nize the presence of the pedestrian crossing 3, thus assuring a safety walking across the driveway 1.

Fig. 2 shows a road display apparatus according to a second embodiment of the present invention in which the road display apparatus is applied to a pedestrian crossing and uses optical fibers which cause light to be forcibly indident upon the road display apparatus.

In Fig. 2, light emitting members 5 rectangular in plan elevation are disposed at suitable regular intervals along the lateral edges of a pedestrian crossing 3. The light emitting members 5 are made of a material having both light absorption properties and directional light-emitting properties, e.g., "STEAL LIGHT" manufactured by Fujitsu Kasei Co., Ltd. in Japan, as in the first embodiment. As shown in Fig. 3, the light emitting members 5 are installed as covering the upper portions of pits 11 dug in the road surface. One ends 12 of optical fibers 9 are housed in the bottom portions of the pits 11. Converging lenses 13 are disposed between the one ends 12 of the optical fibers 9 and the light emitting members 5. The other ends of the optical fibers 9 serve as light receiving ends 10, which are securely supported at a position under and opposite to the irradiation position of a road lamp 8 such as a mercury lamp installed in the vicinity of the pedestrian crossing 3.

In the second embodiment shown in Figs. 2 and 3, when the road lamp 8 is lit during the night or at the time of a rainy or cloudy weather, the light irradiated by the road lamp 8 is incident upon the optical fibers 9 from the light receiving ends 10. Then, the light is transmitted in the optical fibers 9 and projected from the one ends 12 thereof. The light thus projected is enhanced by the lenses 13 and absorbed by the light absorbing surfaces 5s, thereby to emit a secondary light. The secondary light is radiated to the outside from the light radiating portions 5e. This enables vehicle drivers and pedestrians to recognize the presence of the pedestrian crossing 3, thus assuring a safety walking across the driveway.

When the optical fibers 9 are used as combined with the light emitting members 5, the optical energy consumed by the road lamp 8 is efficiently utilized for improving the visibility of the road display apparatus. This makes a great contribution to trafic safety particularly during the night or the like.

Fig. 4 shows a road display apparatus according to a third embodiment of the present invention in which the road display apparatus is applied to a guard rail. In Fig. 4, a guard rail 20 is supported by a plurality of supports 22 installed at suitable regular intervals along a road. A plurality of light emitting members 5 are attached, at suitable spatial intervals, to the guard rail 20 at its surface opposite to the road. In the third embodiment, each of the light emitting members 5 is inclinedly cut to form angular cut surfaces 5c1 at the edges thereof and is provided in the surface thereof with cut grooves 5c2, as shown in Fig. 5. The angular cut surfaces 5c1 and the cut grooves 5c2 form light radiating portions 5e.

In the third embodiment shown in Figs. 4 and 5, when light from the headlights of motor vehicles is irradiated onto the road display apparatus, the light is absorbed from the light absorbing surfaces 5s of the light emitting members 5 to emit secondary light. The secondary light is radiated to the outside from the light radiating portions 5e comprising the angular cut surfaces 5c1 and the cut grooves 5c2. This enables vehicle drivers to clearly recognize the presence of the guard rail 20, assuring traffic safety. At this time, the secondary light emitted from the angular cut surfaces 5c1 is absorbed by the light absorbing surfaces 5s of adjacent light emitting members 5. The secondary light is then radiated to the outside from the light radiating portions 5e comprising the angular cut surfaces 5c1 and the cut grooves 5c2. Such light absorption, emittance of secondary light and light radiation successively occur along the guard rail 20. This enables vehicle drivers to recognize the presence of the guard rail 20 in an instant. When the road display apparatus is applied to a guard rail installed on a curved road, such a curve can also be instantaneously recognized by vehicle drivers. Accordingly, the road display apparatus can make a great contribution to reduction in traffic accident particularly at a curved road where traffic accidents are liable to happen quite often.

To absorb the rays of light reflected from the guard rail 20, it is desired to form gaps 21 between the surface of the guard rail 20 and the light emitting members 5 as shown in Fig. 5. In the third embodiment, each of the light emitting members 5 has a thickness preferably not less than 10 mm, and the distance between adjacent light emitting members 5 is preferably not greater than 1 cm. If the thickness of each of the light emitting members 5 is thin, the light emitting members 5 cannot absorbe light and emit secondary light in a satisfactory manner. If the distance between adjacent light emitting members 5 is too great, the light loss between adjacent light emitting members 5 is great, thus preventing an efficient transmission of light.

Fig. 6 shows a road display apparatus in accordance with a fourth embodiment of the present invention where the road display apparatus is applied to guard ropes. In Fig. 6, guard ropes 26 are supported by a plurality of supports 22 installed at suitable spatial intervals along a road. Fiber-like light emitting members 5 are attached to the guard

ropes 26 at the sides thereof opposite to the road. As shown in Fig. 7, each of the fiber-like light emitting members 5 has a V-shape cut groove 5c3, which serves as a light radiating portion 5e.

In the fourth embodiment shown in Figs. 6 and 7, when rays of light from the headlights of motor vehicles are irradiated to the road display apparatus, the light is absorbed by light absorbing surfaces 5s at the surfaces of the light emitting members 5 to emit secondary light. The secondary light is radiated to the outside from the light radiating portions 5e comprising the cut grooves 5c3. This enables vehicle drivers to clearly recognize the presence of the continuous guard ropes 26, thus assuring driving safety. Likewise in the third embodiment, when the rays of light from the vehicle headlights are irradiated to the road display apparatus of the fourth embodiment, secondary light is emitted throughout the guard ropes 26. This enables vehicle drivers to recognize the presence of the guard ropes 26 in an instant. When the road display apparatus is applied to guard ropes installed on a curved road, such a curve can also be instantaneously recognized by vehicle drivers. Accordingly, the road display apparatus can make a great contribution to reduction in traffic accident particularly at a curved road where traffic accidents are liable to happen quite often.

In the third or fourth embodiment, a character display may be formed with characters such as "Attention ! Steep Curve" marked with any of a variety of paints at the rear sides of the light emitting members 5. In this case, the emittance of secondary light enables such characters to be readily read even during the night. This further contributes to traffic safety.

Figs. 8 and 9 show a light source for road display apparatus in accordance with a first embodiment of the present invention. In Fig. 8, a plane mirror condensing plate 31 and a light condensing device 32 form a light condensing unit 33 for collecting external light 34. Optical fibers 35 are shown as an example of light transmission means. One ends of the optical fibers 35 are connected to one end of the light condensing device 32 forming the light condensing unit 33. Reflected light 36 from the plane mirror condensing plate 31 is condensed through the light condensing device 32 and is incident upon the one ends of the optical fibers 35. The light is then transmitted in a predetermined direction through the optical fibers 35. As shown in Fig. 9, a light amplifier 37 is disposed in the middle course of the optical fibers 35, and an element panel 38 designed for a road display is connected to the other ends of the optical fibers 35.

In the first embodiment of the light source for road display apparatus of the present invention shown in Figs. 8 and 9, the plane mirror condensing plate 31 and the light condensing device 32 may be attached to, for example, a guard rail, and the element panel 38 may be installed at a place where vehicle drivers or pedestrians can readily recognize the panel 38. The external light 34 coming from the headlights of motor vehicles or the like is incident upon the plane mirror condensing plate 31 and reflected therefrom. The reflected light 36 is then condensed by the light condensing device 32 and is incident upon the one ends of the optical fibers 35. The light is transmitted in a predetermined direction through the optical fibers 35. The light as amplified by the light amplifier 37 in the middle course of such light transmission is emitted through the element panel 38. This serves as road display apparatus and informs road conditions or the like to vehicle drivers and pedestrians.

In this first embodiment, it is supposed that the area of the light condensing device 32 at a light inlet surface 32a thereof is defined as S0, and the area of the light condensing device 32 at a light outlet surface 32b thereof is defined as S1. The light condensing rate is determined by the area ratio (S0 S1). By adjusting the area ratio according to a variety of conditions, the intensity values of input and output lights may be suitably adjusted.

Fig. 11 shows a light source for road display apparatus in accordance with a second embodiment of the present invention. In this second embodiment, a light guide 40 is used, instead of optical fibers, as the light transmitting means. The light guide 40 is made of a pipe 41 of plastics such as polycarbonate, ceramics or metal. Formed on the inner surface of the pipe 41 is a light reflection film 42 of aluminium, gold, silver, copper, nickel, rodium or the like. Such a film may be formed by plating or the like. When light condensed at the light condensing unit 33 passes through the pipe 41, the light is transmitted in a predetermined direction while repeatedly reflected by the reflection film 42. Such a light guide 40 may be readily mass-produced by a conventional technique. The light source using such a light guide 40 is more economical than the light source using the optical fibers 35. Thus, the light guide shown in Fig. 11 is suitable as the light transmitting means in the light source for road display apparatus installed in large quantities.

Fig. 12 shows a light source for road display apparatus in accordance with a third embodiment of the present invention. This embodiment employs as a plane light condensing plate forming a light condensing unit, a Fresnel lens 44 through which external light 34 such as rays of light from the headlights of motor vehicles is adapted to pass in a straight manner and which is adapted to guide a transmitted light 43 to a light condensing device

32. In such an arrangement, no light loss is produced due to reflection. This is more advantageous in view of the efficiency of condensing the external light 34.

In the foregoing, the description has been made of the road display apparatus applied to a pedestrian crossing, a guard rail and guard ropes. However, the road display apparatus of the present invention may be applied to road center separation zones, walking bridges, tunnels and the like with similar effects to those above-mentioned produced.

Claims

1. A road display apparatus comprising a display and a light emitting member disposed at said display at a predetermined portion thereof, said light emitting member being made of a material having both light absorption properties and directional light-emitting properties, said light emitting member having a light absorbing surface for absorbing light coming from a variety of light sources, and a light radiating portion for emitting the absorbed light as secondary light, which is then radiated to the outside.

2. A road display apparatus according to Claim 1, wherein the material having both light absorption properties and directional light-emitting properties is a reain material containing a fluorescent dye, said resin material being molded into a predetermined configuration to form the light emitting member.

3. A road display apparatus according to Claim 1, wherein the light emitting member is used as combined with optical fibers such that the light outlet ends of said optical fibers are opposite to the light absorbing surface of said light emitting member.

4. A road display apparatus according to Claim 1, wherein the light emitting member is used alone.

5. A road display apparatus according to Claim 1, wherein the light emitting member has a light radiating portion formed by a cut surface or angular cut surface.

6. A road display apparatus according to Claim 3, wherein a converging lens is disposed between the light absorbing surface of the light emitting member and the light outlet ends of the optical fibers.

7. A light source for road display apparatus, comprising (i) a light condensing unit including a plane light condensing plate and a light condensing device for collecting external light, and (ii) light transmission means for transmitting light condensed at said light condensing unit in a predetermined direction.

8. A light source for road display apparatus according to Claim 7, wherein the light transmission means is formed by a light guide comprising a pipe and a light reflection thin film formed on the inner surface of said pipe.

9. A light source for road display apparatus according to Claim 7, wherein the light transmission means is formed by optical fibers.

10. A light source for road display apparatus according to Claim 7, wherein the plane light condensing plate is a plane mirror for condensing external light as reflected therefrom.

11. A light source for road display apparatus according to Claim 7, wherein the plane light condensing plate is a Fresnel lens for condensing external light as transmitted therethrough.

12. A light source for road display apparatus according to any of Claims 7 to 11, wherein a light amplifier is disposed in the middle course of the light transmission means.

Fig.1

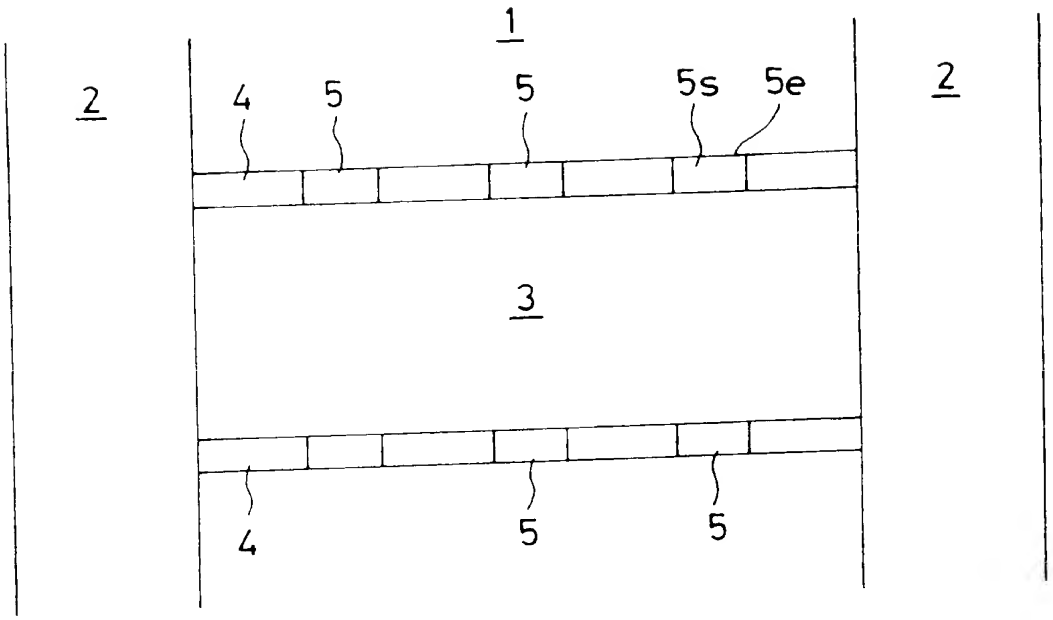


Fig.2

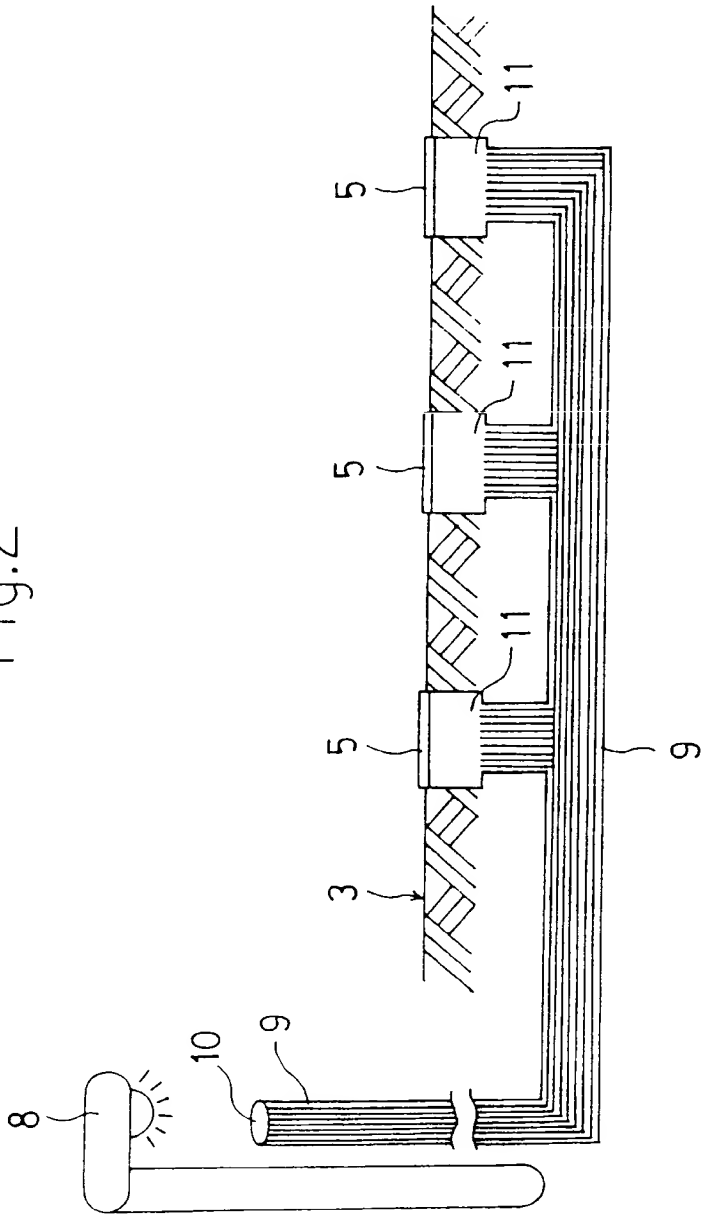


Fig.3

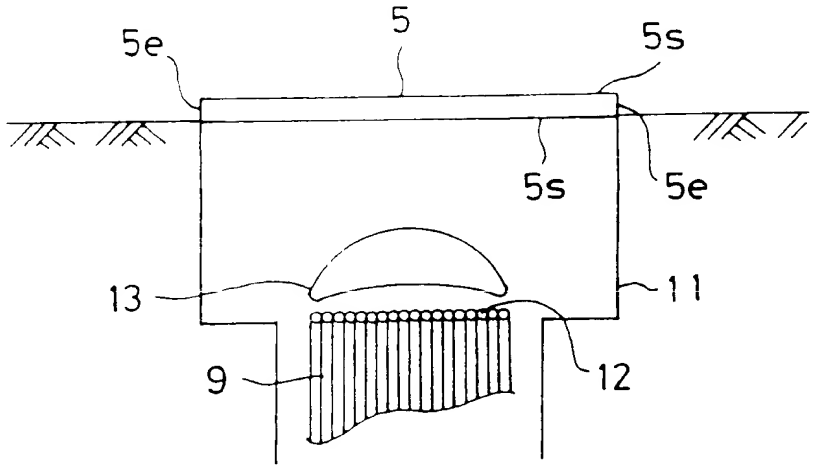


Fig.4

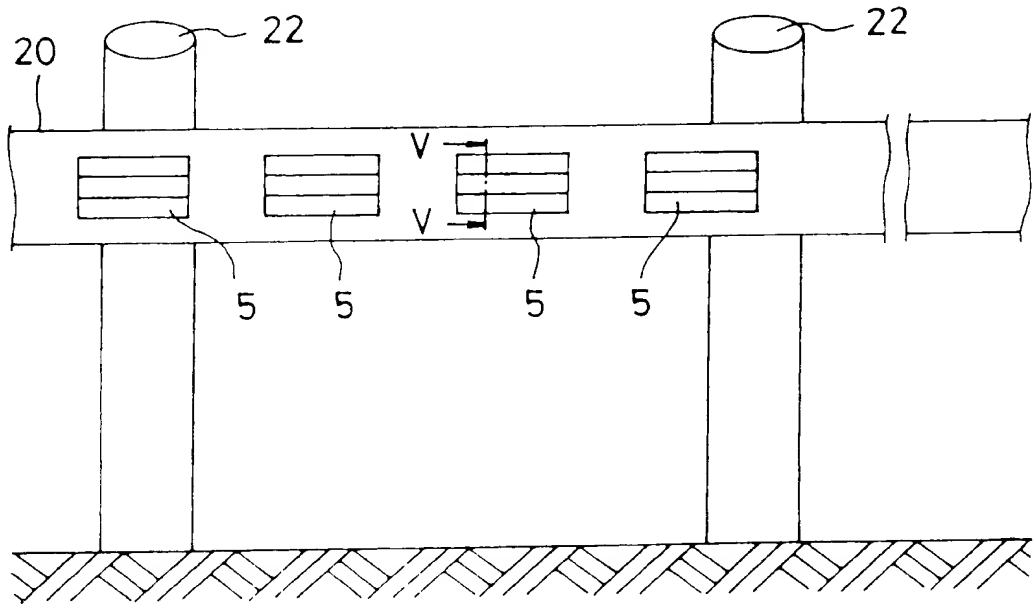


Fig.5

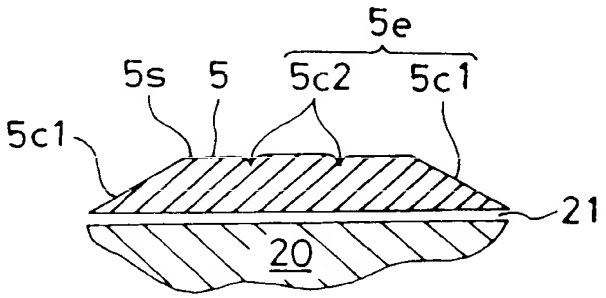


Fig.7

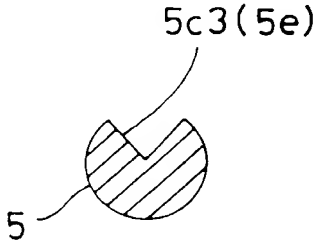


Fig.6

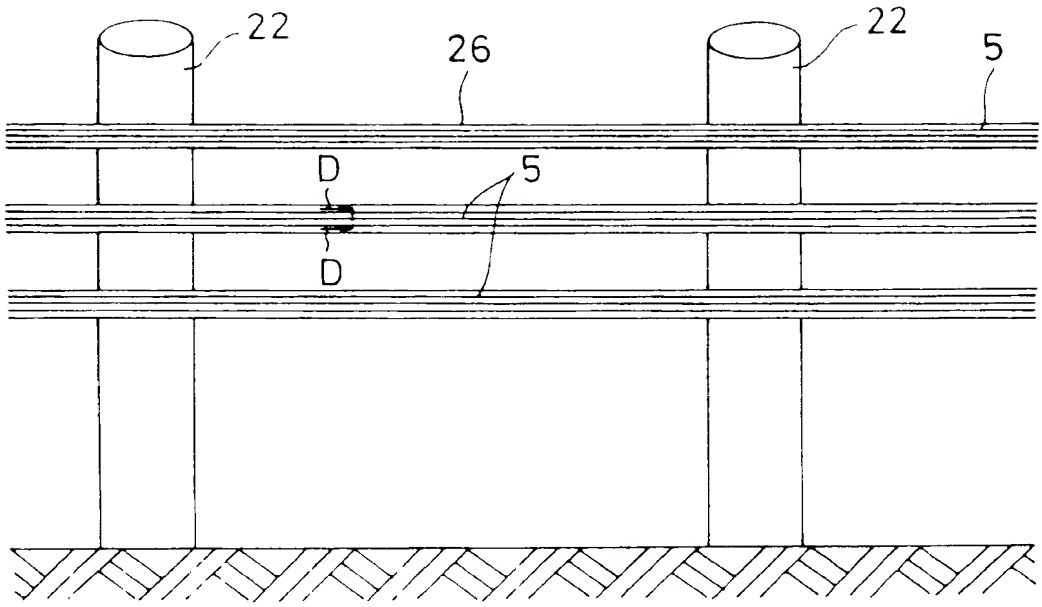


Fig.8

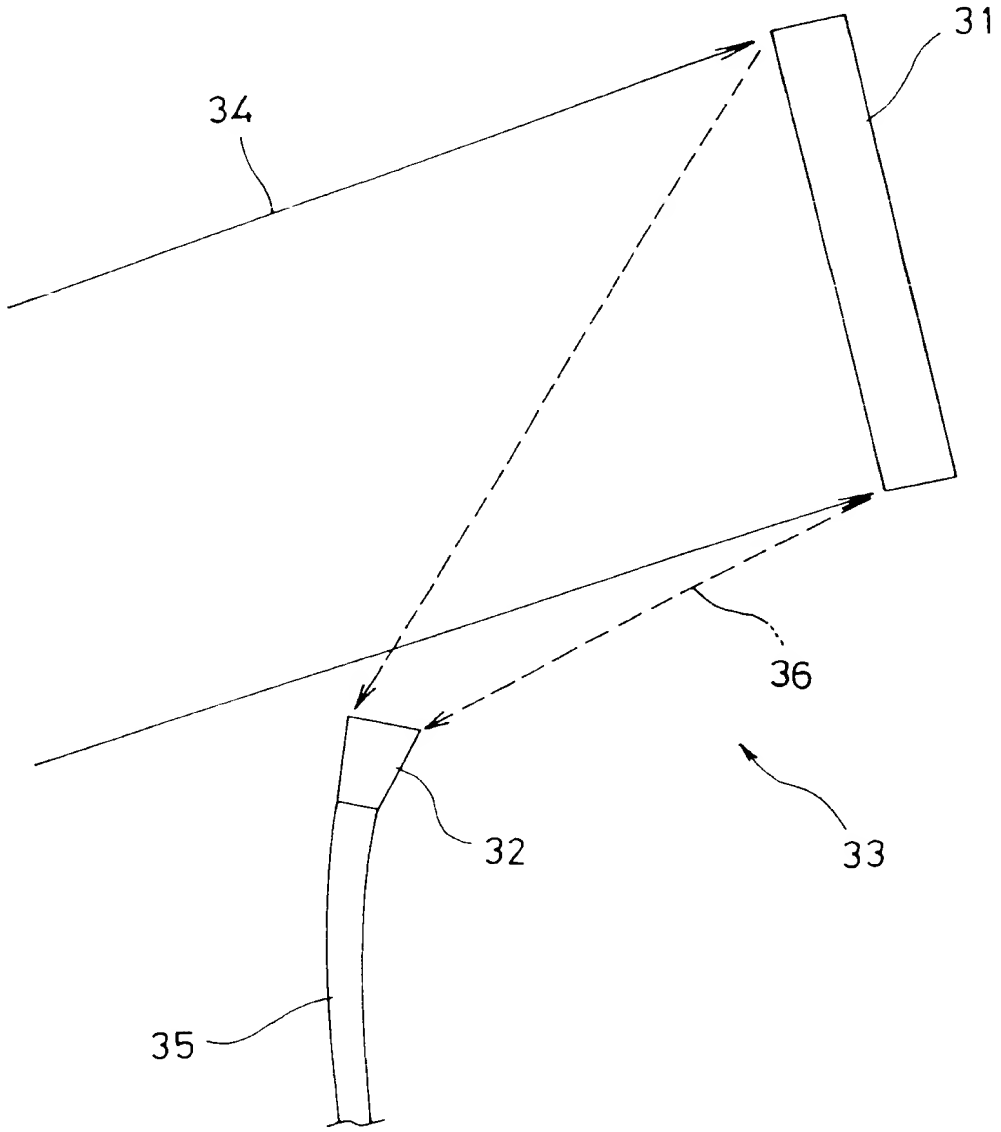


Fig.9

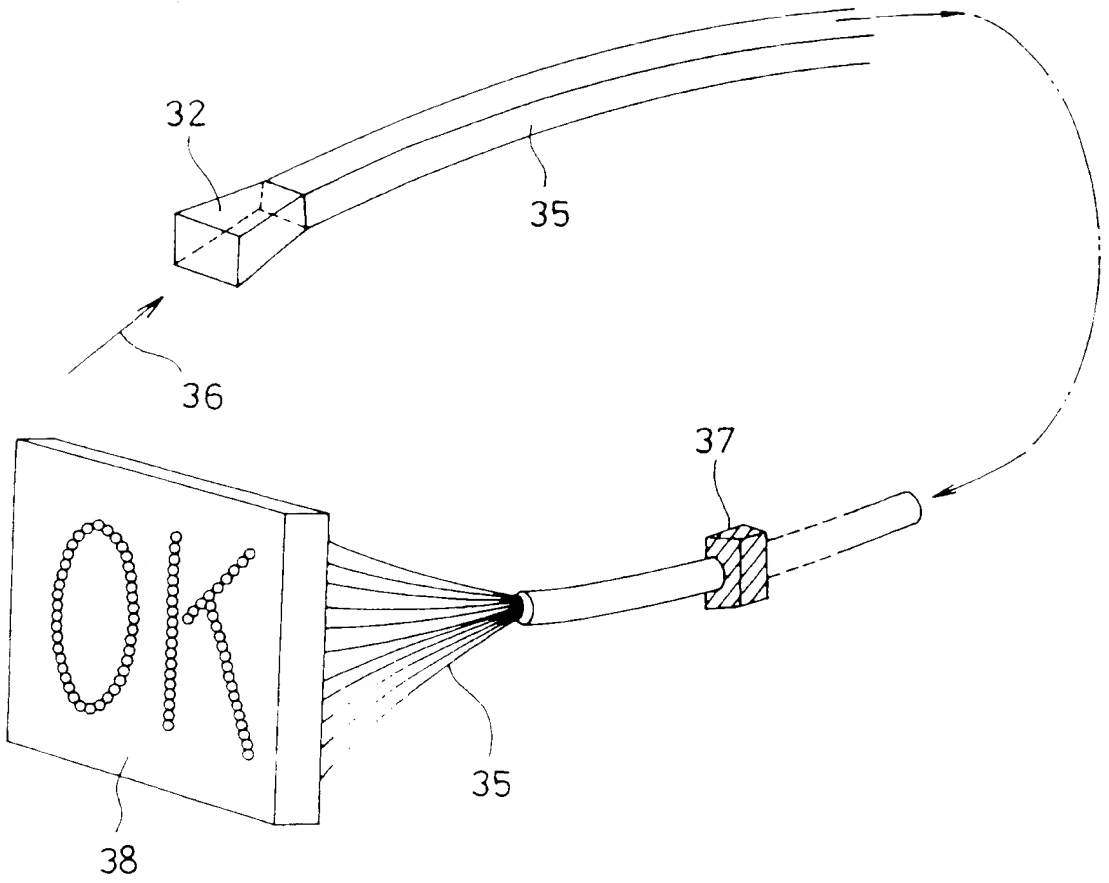


Fig.10

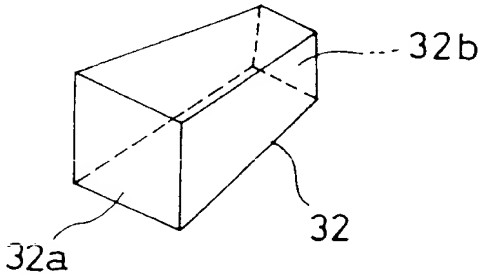


Fig.11

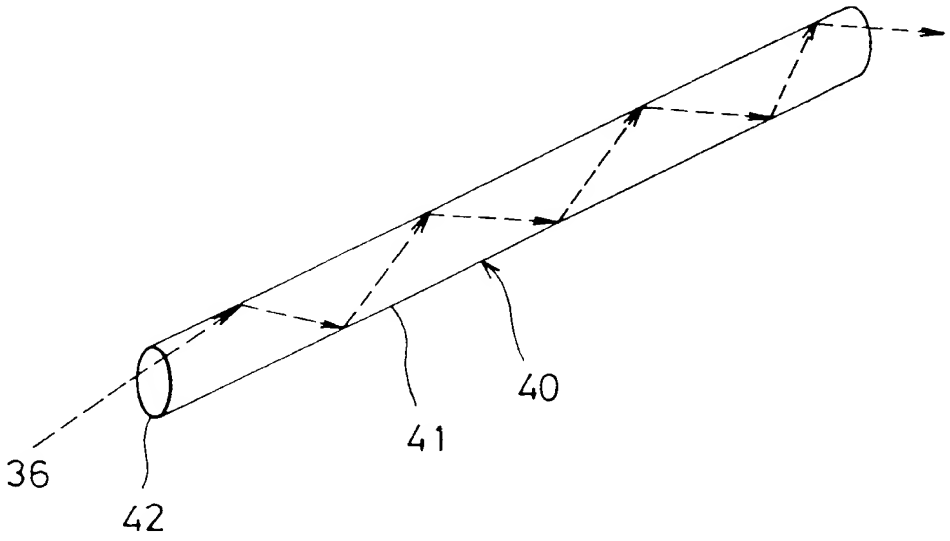
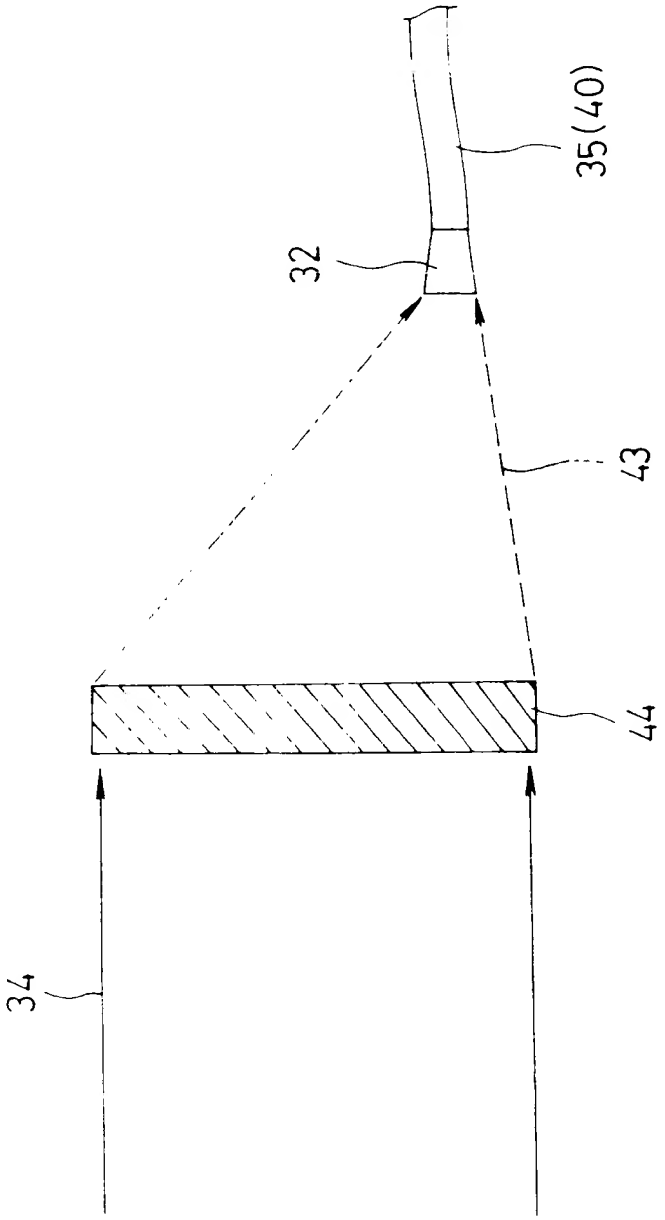


Fig.12



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EUROPEAN SEARCH REPORT

Application Number

EP 91 11 8440

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	GB-A-2 159 559 (EDWARD MCDONALD BRIGGS) * the whole document *	1-7,9,10	E01F9/00 G08G1/09
Y	EP-A-0 272 053 (FUJITSU LIMITED) * the whole document *	1-7,9,10	
Y	US-A-3 829 857 (ALLAN ET AL.) * the whole document *	3,6	
A	US-A-4 591 232 (JESKEY) * the whole document *	1-5	
A	EP-A-0 413 877 (INNOVAZIONE S.P.A.)	1-10	
A	EP-A-0 390 749 (INNOVAZIONE)		
A	EP-A-0 401 175 (INNOVAZIONE)		
A	GB-A-2 177 742 (THE SECRETARY OF STATE FOR TRANSPORT)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
E01F G08G G08B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 JULY 1992	REEKMANS M.V.

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